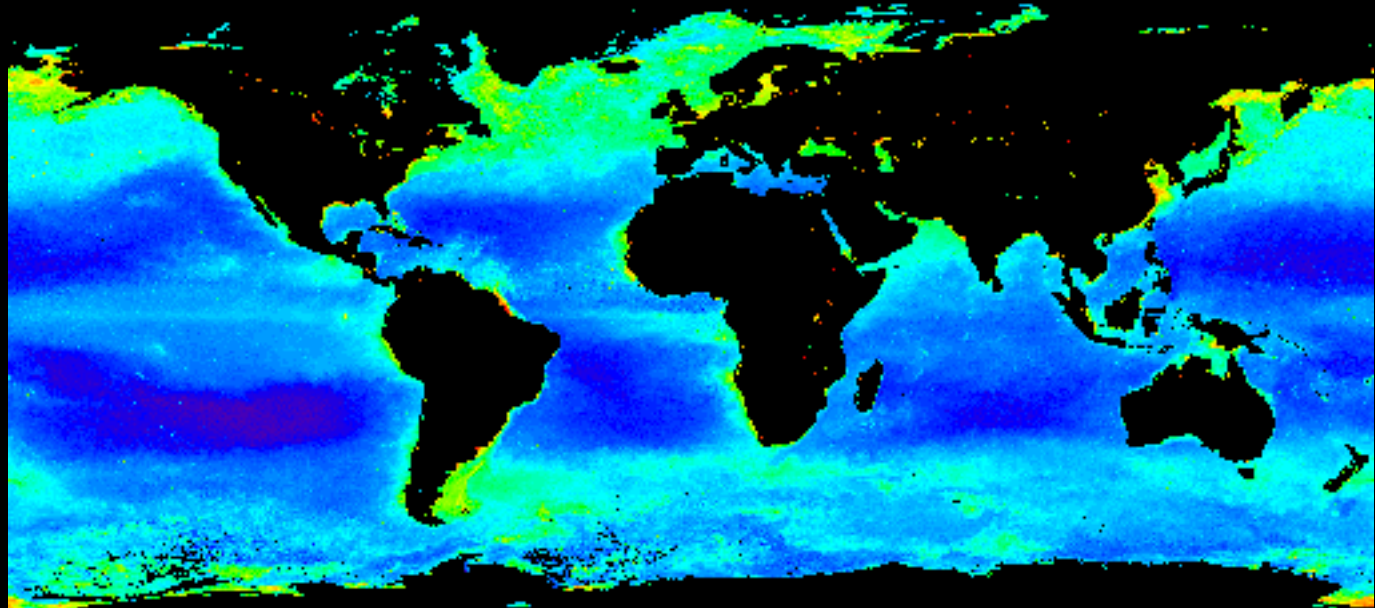
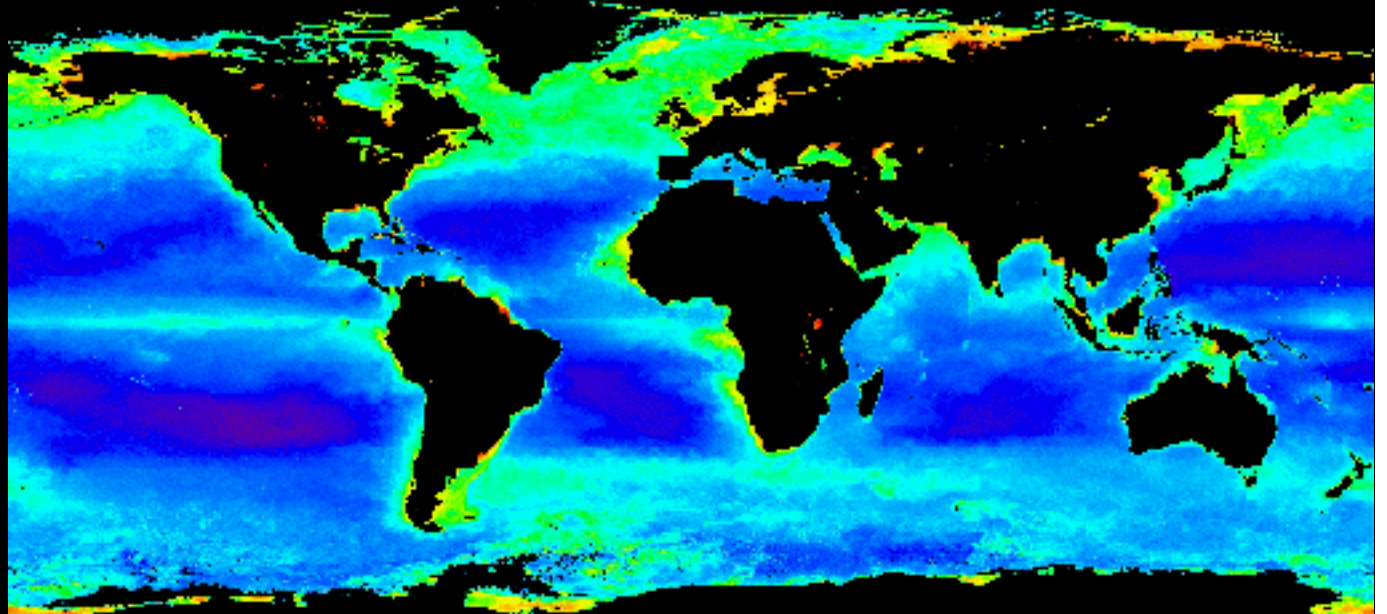


NASDA and NASA collaboration: OCTS global data set

OCTS
Chlorophyll
Nov 96 - Jun 97



SeaWiFS
Chlorophyll
Jan 98 - Dec 98



Reprocessing of the OCTS Global Dataset

a Collaborative Effort Between NASDA and the NASA SIMBIOS Project

Gene Feldman

Bryan A. Franz

et al.

Many People Contributed to This Effort

James G. Acker, SSAI, Goddard DAAC, USA

Ichio Asanuma, EORC, NASDA, Japan

Sean Baily, Futuretech Corp., SeaWiFS and SIMBIOS Projects, USA

Robert E. Eplee, Jr., SAIC, SeaWiFS and SIMBIOS Projects, USA

Gene Feldman, code 902.3, NASA Goddard Space Flight Center, USA

Bryan A. Franz, SAIC, SeaWiFS and SIMBIOS Projects, USA

Hajime Fukushima, Tokai University, Japan

Joel Gales, Futuretech Corp., SeaWiFS and SIMBIOS Projects, USA

Norman Kuring, code 902, NASA Goddard Space Flight Center, USA

Stephane Maritorena, ICESS UCSB, USA

Hiroshi Murakami, EORC, NASDA, Japan

Jean-Marc Nicolas, Univ. des Sciences et Technologies de Lille, France

John E. O'Reilly, NOAA, NMFS, Narragansett, RI 02882, USA

Suhung Shen, George Mason University, Goddard DAAC, USA

Paul Smith, SAIC, SeaWiFS and SIMBIOS Projects, USA

Tasuku Tanaka, EORC, NASDA, Japan

Menghua Wang, University of Maryland, USA

John Wilding, SAIC, SeaWiFS and SIMBIOS Projects, USA

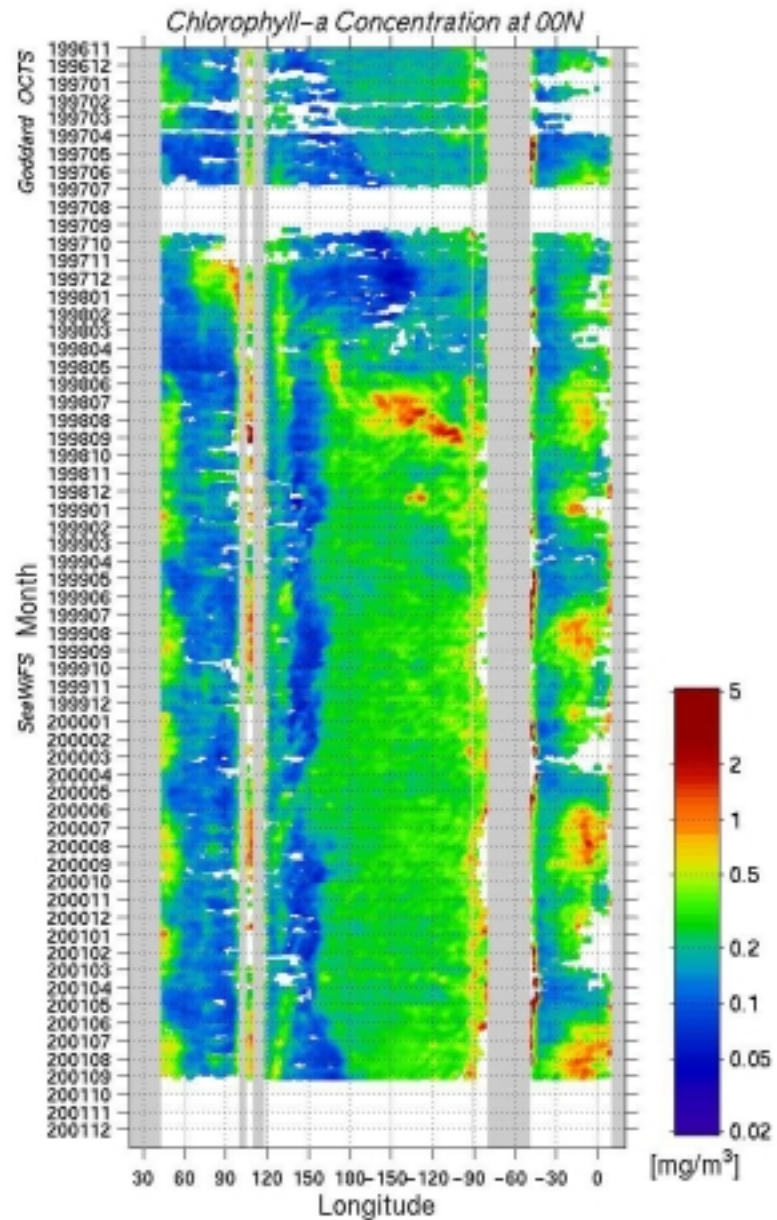
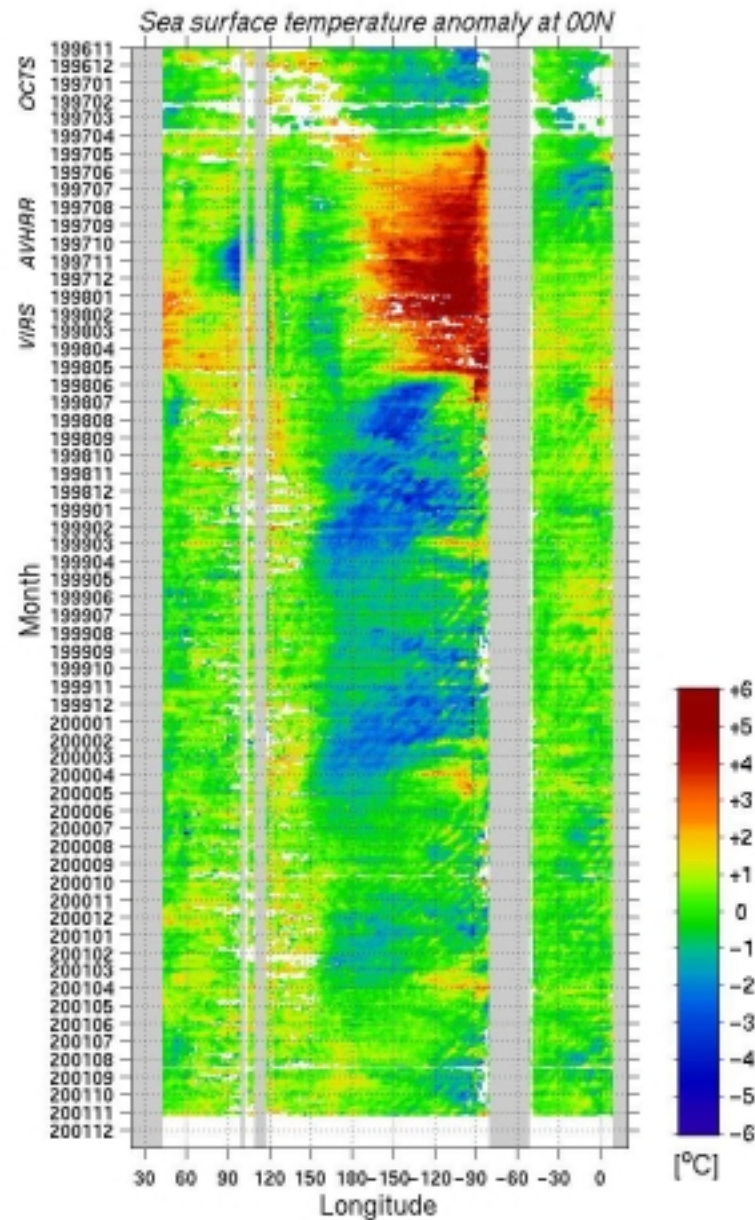
Bill Woodford, Futuretech Corp., SeaWiFS and SIMBIOS Projects, USA

Purpose of Work

Evaluate and Enhance Consistency of Global Ocean Color Archive from November 1996 to Present Day.

- Minimize processing and calibration differences between OCTS and SeaWiFS.
- Simplify user interface to both datasets through common formats, common data distribution systems, and standardized software tools.
- Increase confidence in studies of El Niño transition, Kelvin/Rossby wave propagation in 1996-1998 period.

Effects of El Niño



OCTS and SeaWiFS Spectral Bands

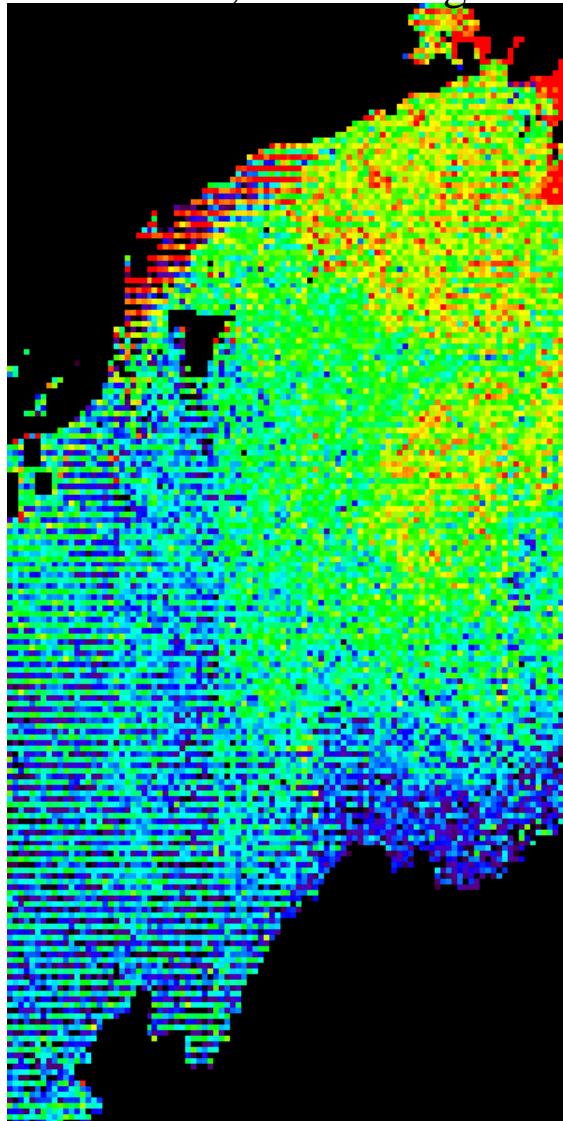
Band	OCTS	SeaWiFS
1	412	412
2	443	443
3	490	490
4	520	510
5	565	555
6	670	670
7	765	765
8	865	865

NASA OCTS vs NASDA V4 Processing

- Atmospheric Correction
 - aerosol selection using 765/865 rather than 670/865
- Chlorophyll Algorithm
 - modified OC4 (O'Reilly) rather than OCTS-C (Kishino)
- NASA only
 - Vicarious Calibration to MOBY (Wang, et al.)
 - Iterative correction for NIR water-leaving radiance (Siegel, et al.)
 - Filtering to reduce residual striping noise.

Effect of Radiance Filtering

Chl-a, no filtering



For each band:

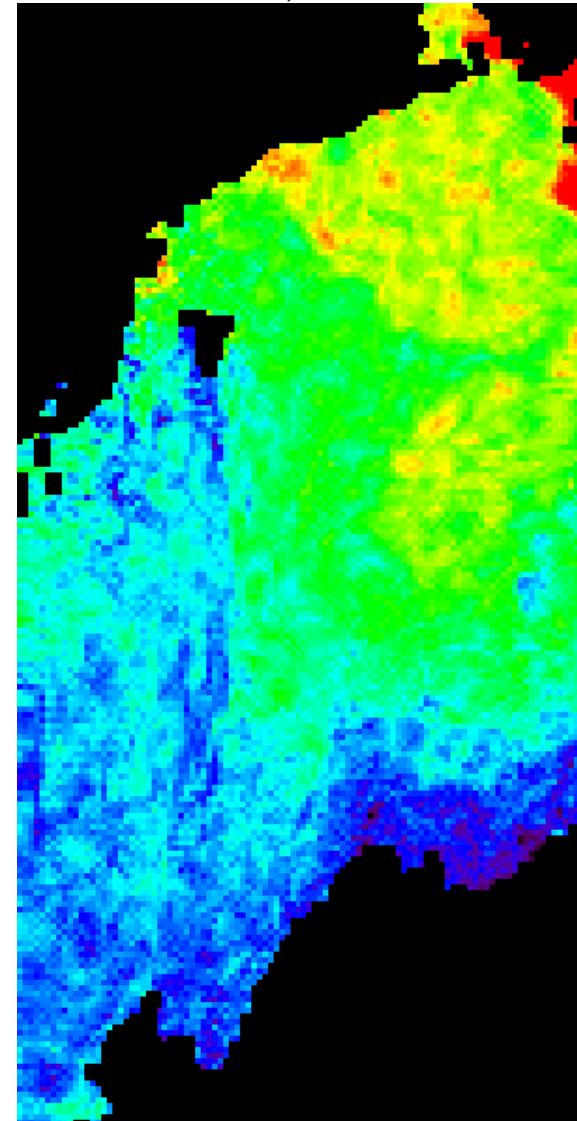
$$L_t' = L_r + f(L_t - L_r)$$

f is the mean of the interquartile range applied over a sliding 5x5 diamond-shaped sampling window

0	0	1	0	0
0	1	1	1	0
1	1	1	1	1
0	1	1	1	0
0	0	1	0	0

Diamond Filter
Kernel

Chl-a, filtered



0

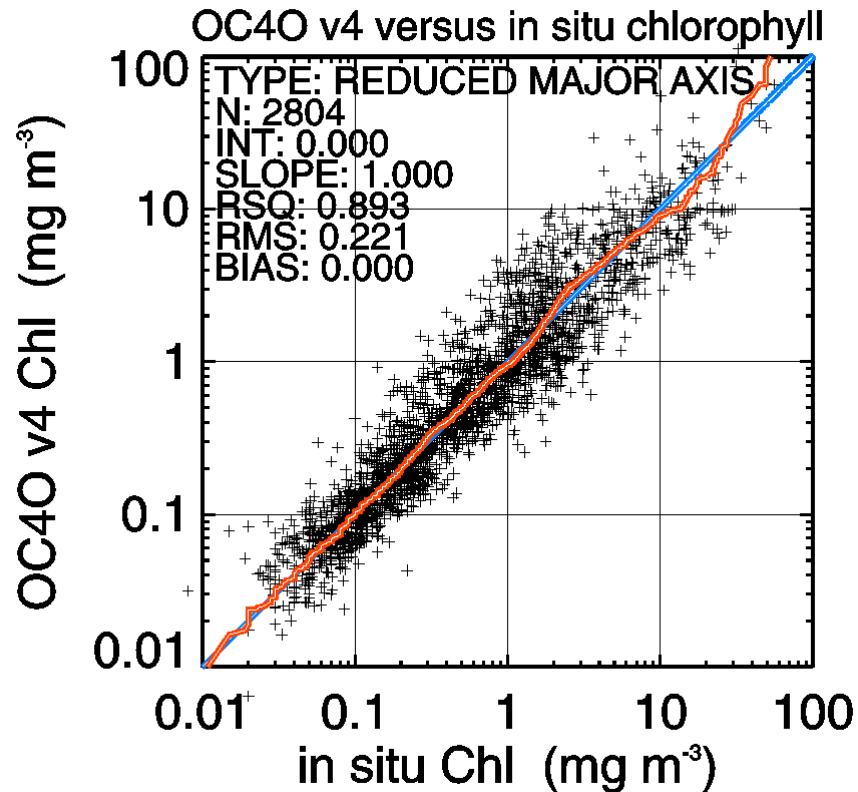
mg m⁻³

0.2

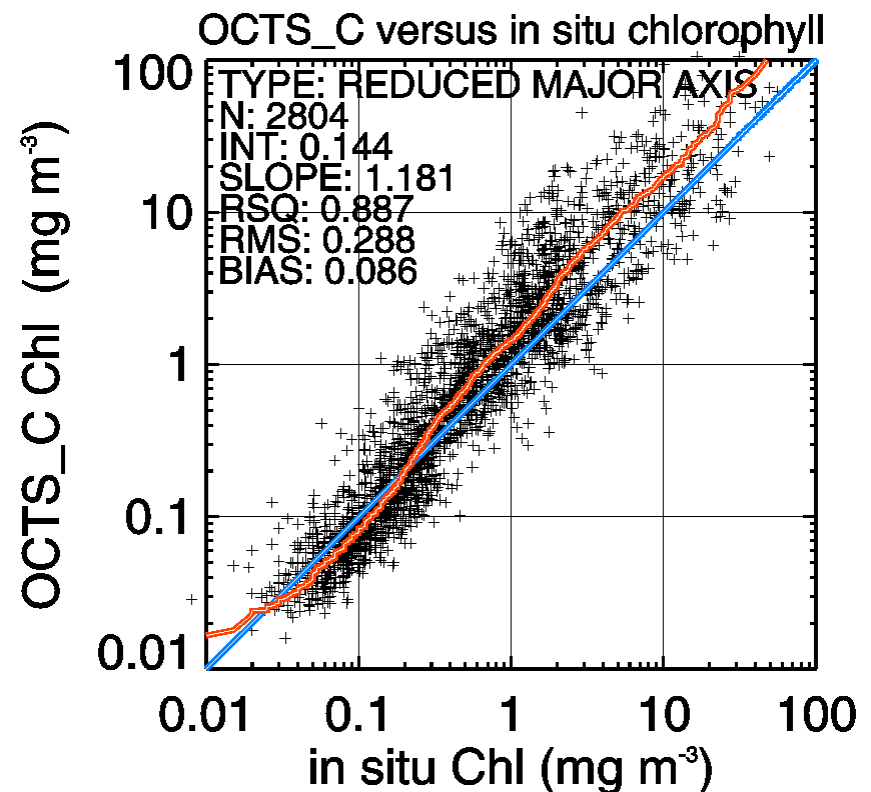
Effect of Chlorophyll Algorithm

NASA OC4O chlorophyll algorithm tuned to 2804-point *in situ* database
OCTS-C of NASDA over-predicts high, under-predicts low *in situ* chlorophyll

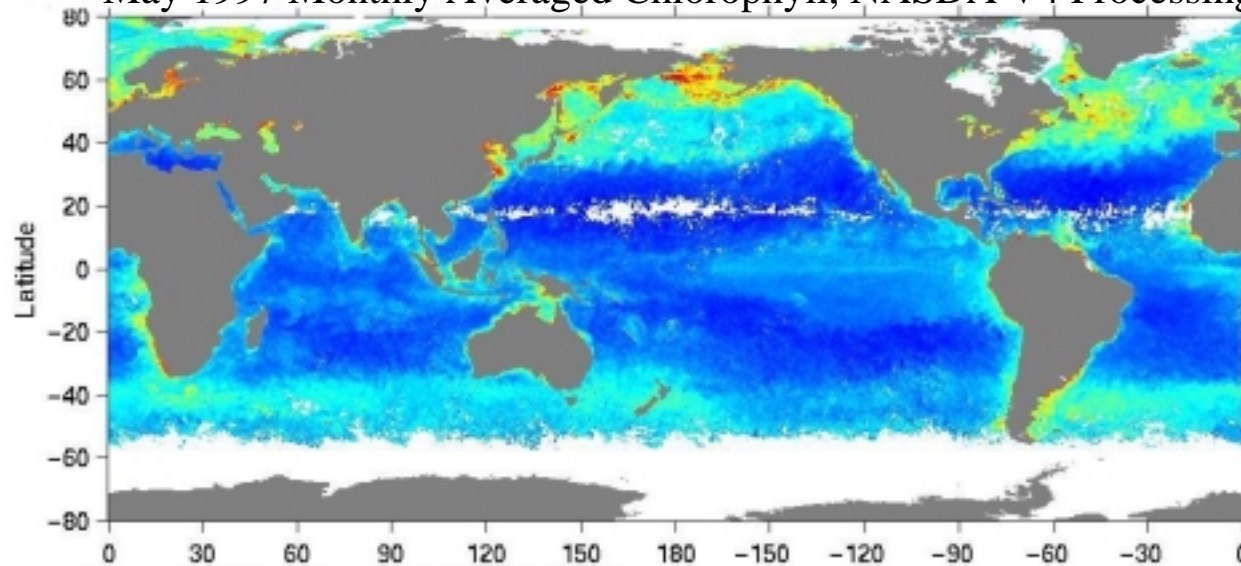
NASA



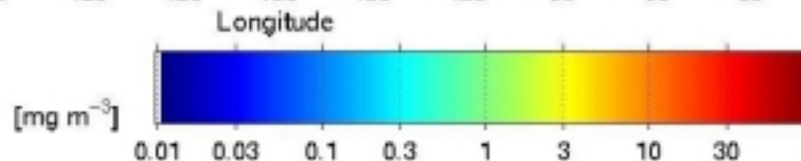
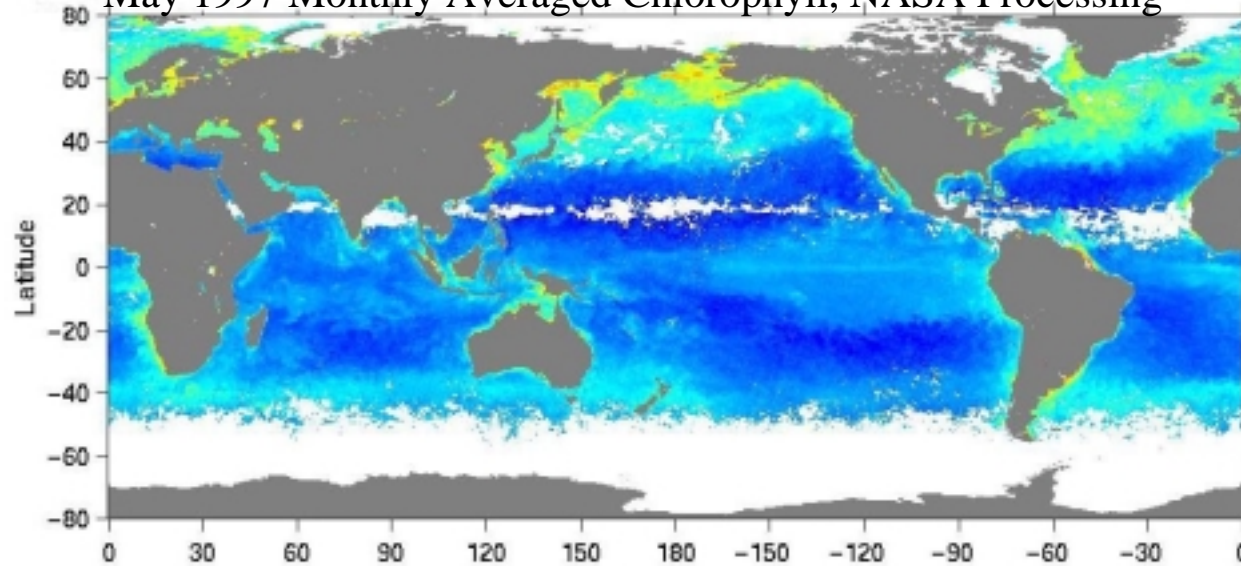
NASDA



May 1997 Monthly Averaged Chlorophyll, NASDA V4 Processing



May 1997 Monthly Averaged Chlorophyll, NASA Processing

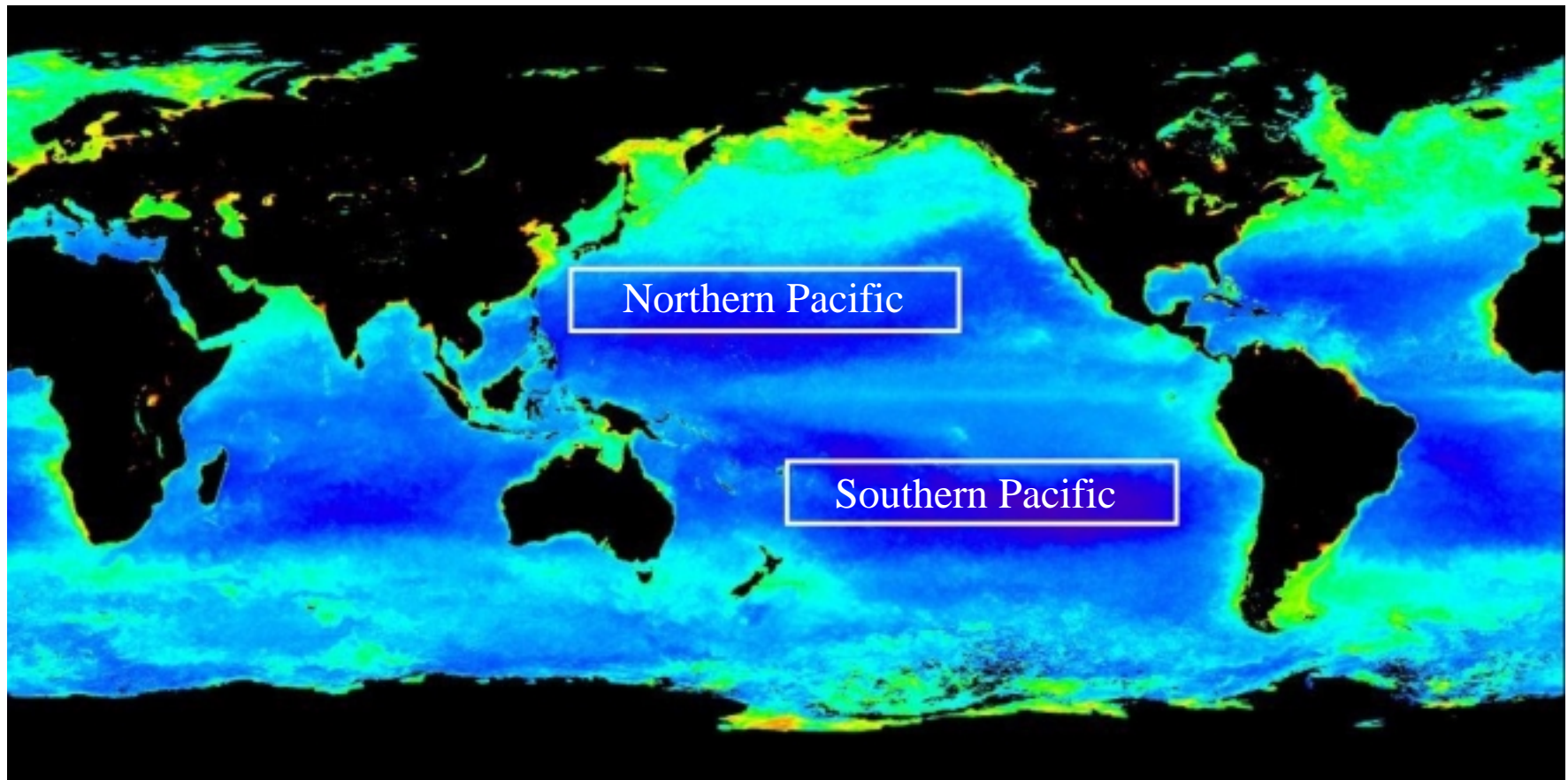


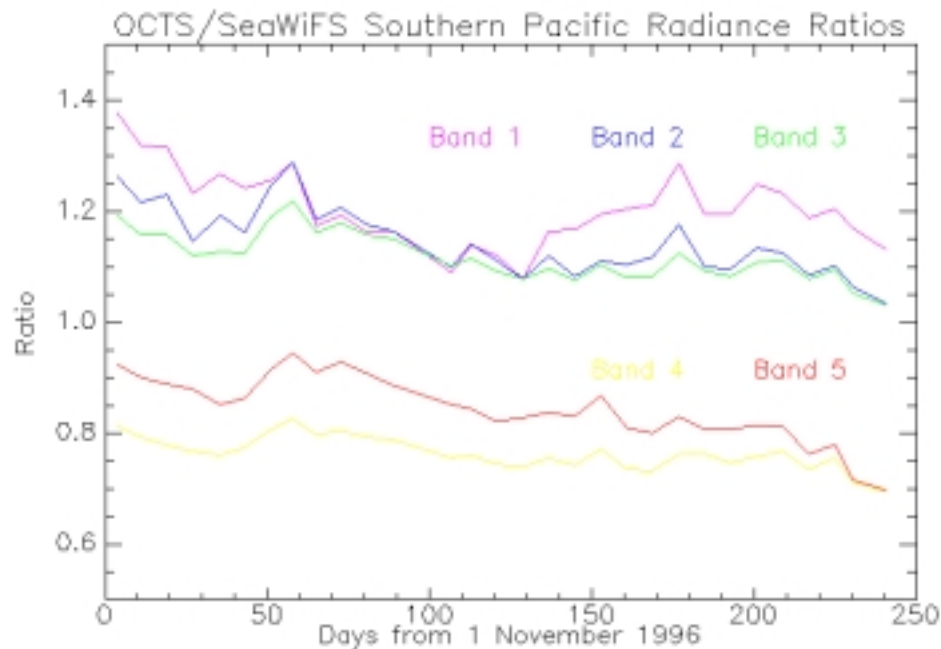
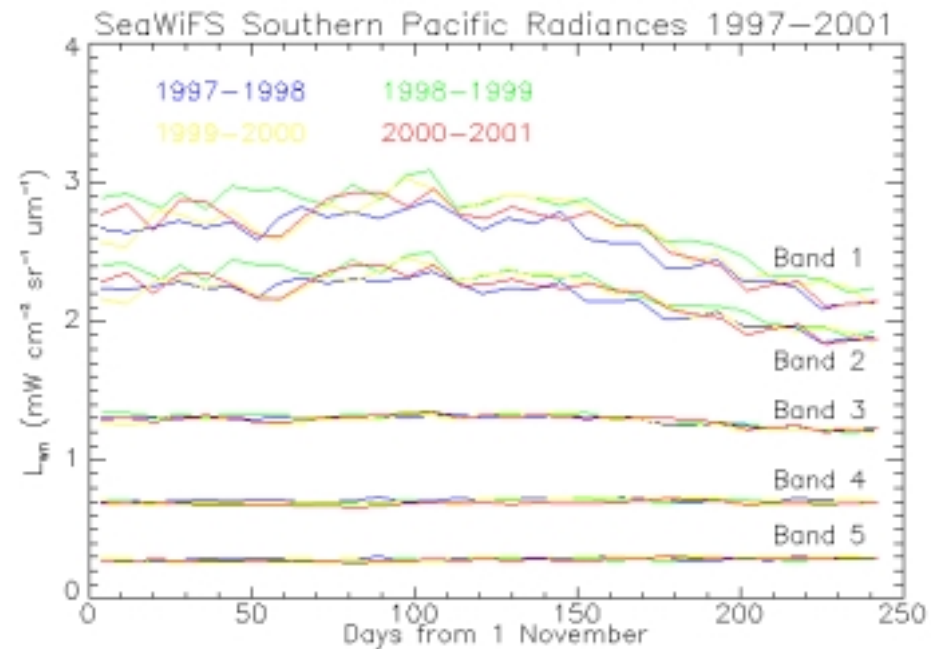
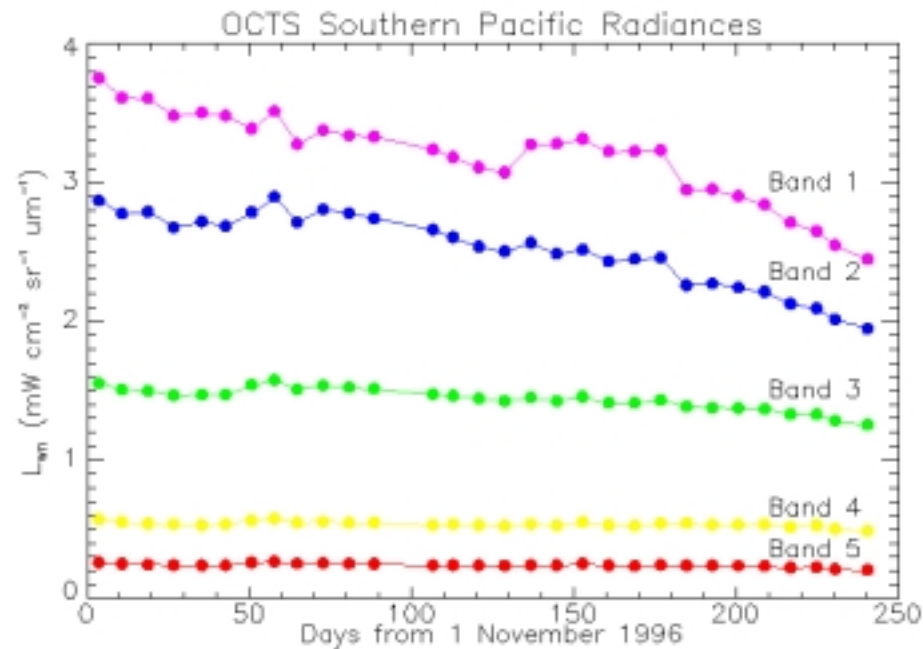
NASA OCTS global chlorophyll distribution shows good agreement with NASDA v4 results.

High chlorophyll reduced in coastal regions and inland waters, due to OC4O chlorophyll algorithm and corrections for non-zero water-leaving radiance in the NIR.

Temporal Stability: OCTS vs SeaWiFS

comparing oceanic optical properties retrieved by OCTS to the subsequent 4-year record of colocated SeaWiFS measurements

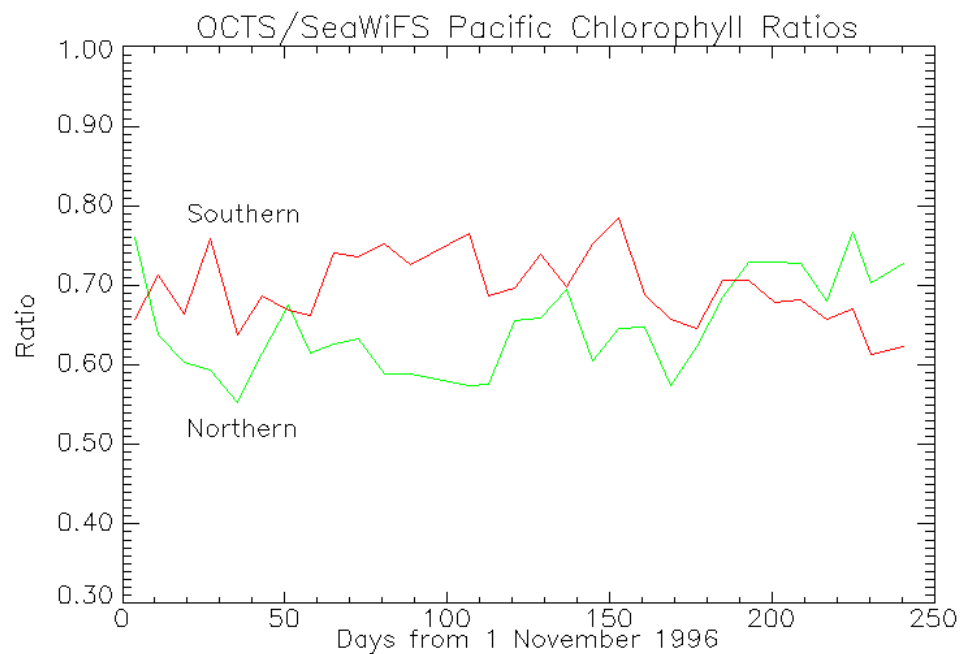
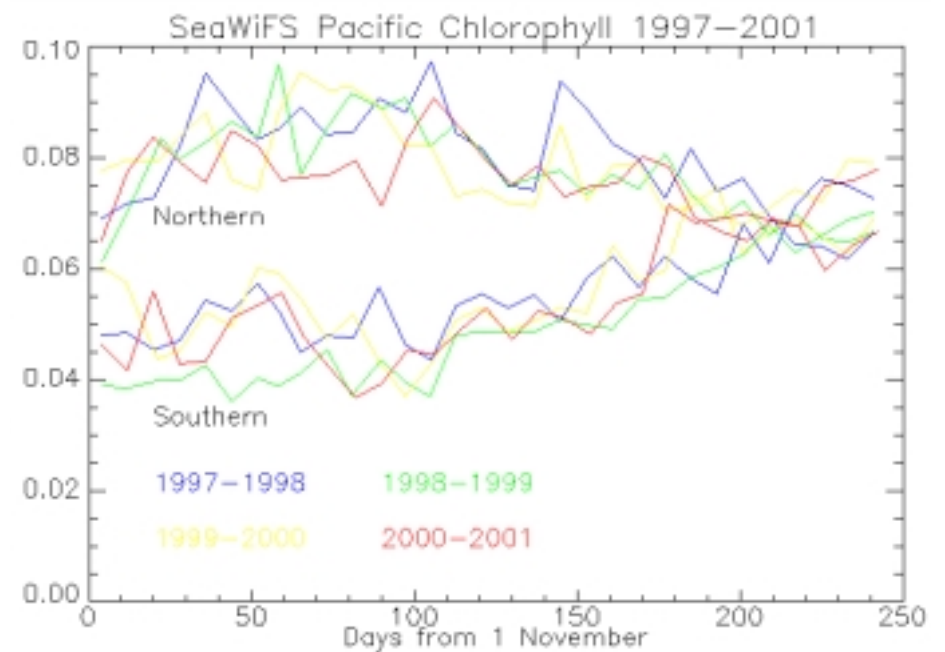
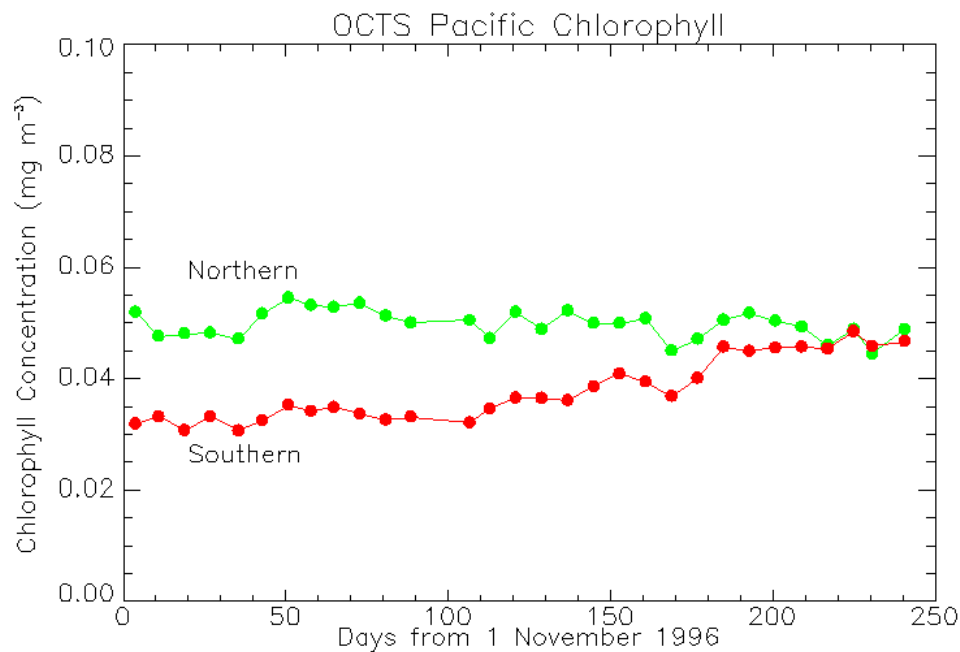




SeaWiFS shows region to be very stable from year to year, with no observable impact of El Niño/La Niña transition.

OCTS shows similar seasonal trends, but relative to SeaWiFS bands 1-3 are high. Lower values in bands 4-5 due in part to band center wavelength differences.

OCTS to SeaWiFS ratio appears to be decreasing with time.



OCTS shows similar seasonal trends, but with a consistent bias relative to SeaWiFS of 30% (0.01 to 0.02 mg m^{-3} lower).

NASA OCTS vicarious calibration may be a problem. MOBY data from 1996-1997 was limited in quantity.

NASA OCTS GAC Data Distribution

Long-term Archive and Distribution via Goddard DAAC:

- <http://daac.gsfc.nasa.gov/>
- level-1A through level-3 mapped data available
- free and open access to all
- temporal/spatial search and order capabilities
- interactive browse
- level-3 parameter subsetting
- concurrent ancillary meteorological and ozone data

Additional Access via NASDA EORC, NASA SIMBIOS:

- <http://www.eorc.nasda.go.jp/ADEOS/>
- http://simbios.gsfc.nasa.gov/satellite_data.html

Summary

- A successful and rewarding collaboration has been established between NASDA and NASA to enhance the consistency between the OCTS and SeaWiFS missions.
- Processing algorithm differences have been minimized.
- Data access and use has been simplified through common data formats, software tools, and distribution systems.
- Optical properties retrieved with OCTS show reasonable agreement with SeaWiFS in the north and south Pacific regions, but differences remain.
- Relative to SeaWiFS, OCTS shows evidence of temporal change in regions where SeaWiFS shows excellent annual repeatability.

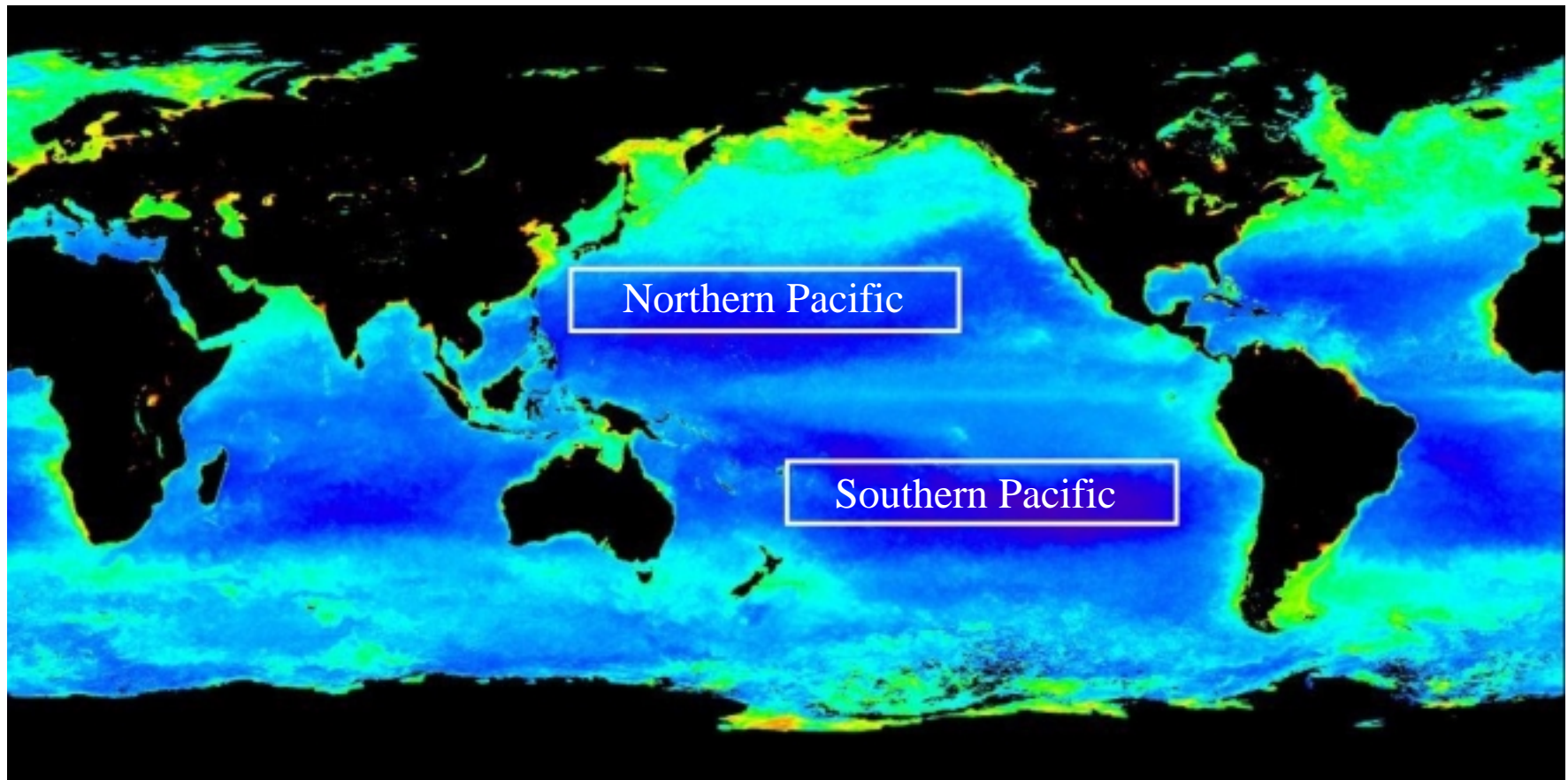
Future Work

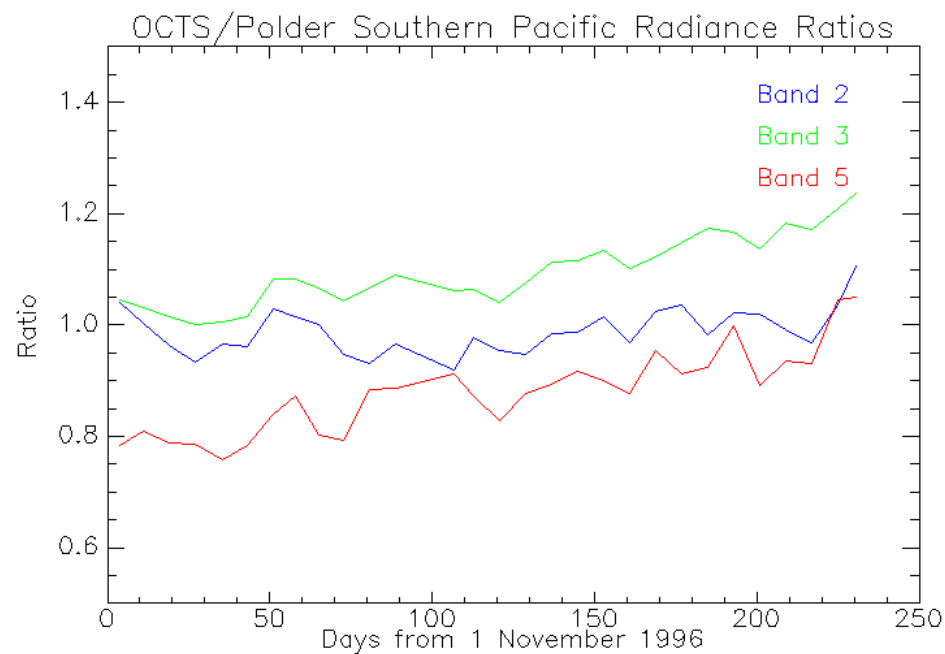
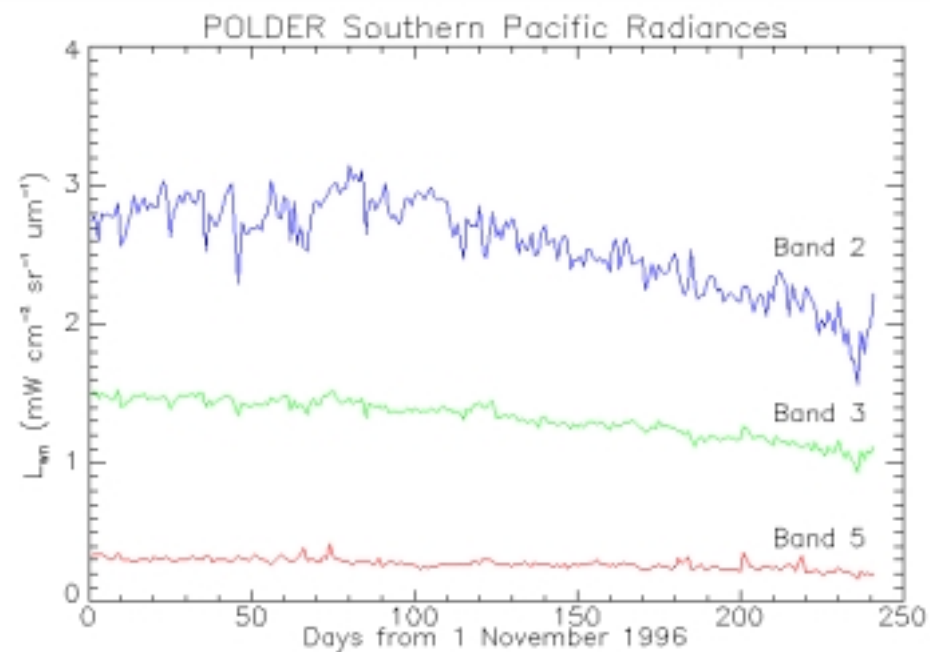
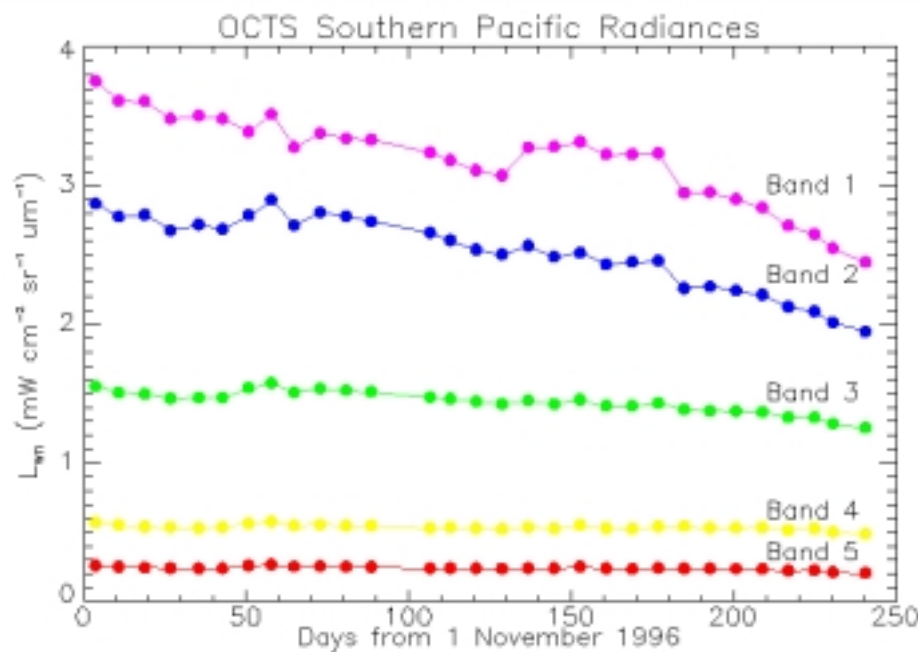
- Within the SeaWiFS processing system, the entire OCTS archive can be processed from Level-1A through Level-3 in 1-2 weeks. Future reprocessing is likely, as calibration and processing methodologies are improved.
- *In situ* data suitable for vicarious calibration of OCTS was limited. Only five usable measurements were obtained by MOBY during the OCTS lifespan (Wang, et al.).
- Consider cross-calibrating OCTS to SeaWiFS. Using seasonal trends from one or more selected regions as the calibration target, both the average vicarious gains and relative temporal gains could be derived.
- Consider using MOS as a transfer radiometer. MOS is a spaceborne ocean color sensor with limited geographic coverage which spans the lifetimes of OCTS and SeaWiFS.

Supporting Slides

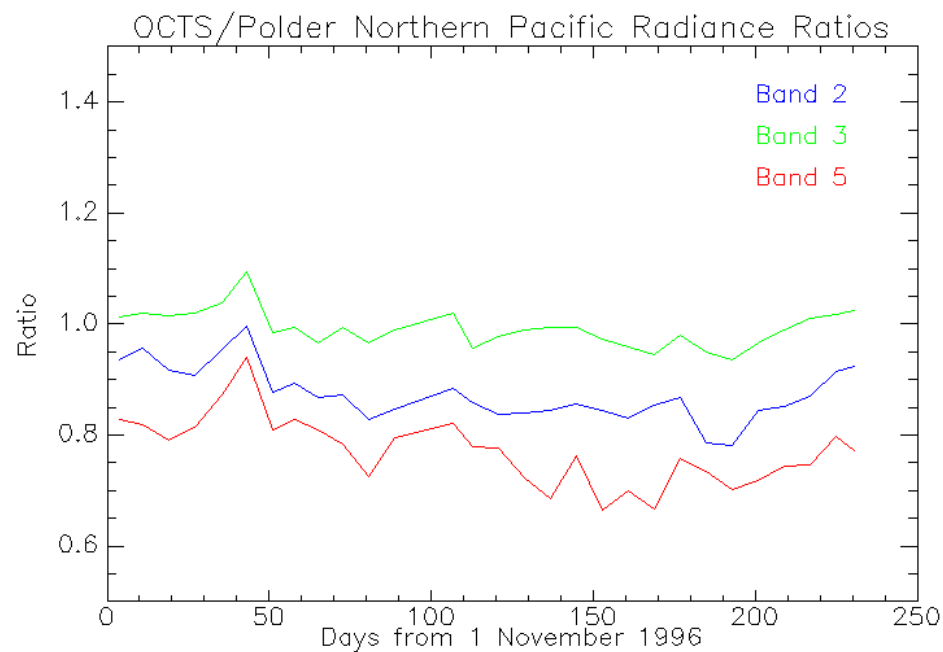
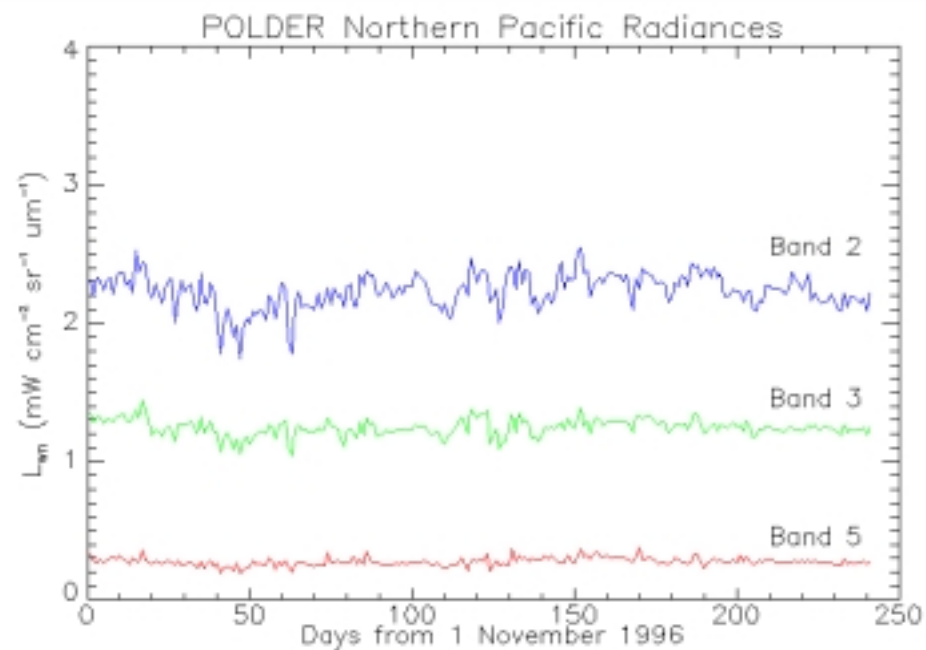
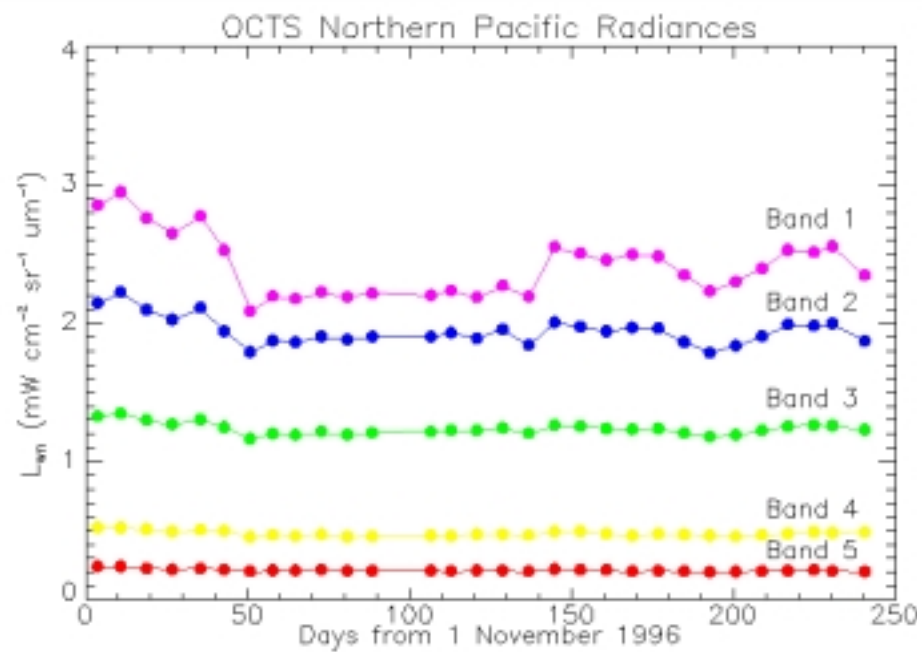
Temporal Variability: OCTS vs POLDER

concurrent measurements from two different sensors





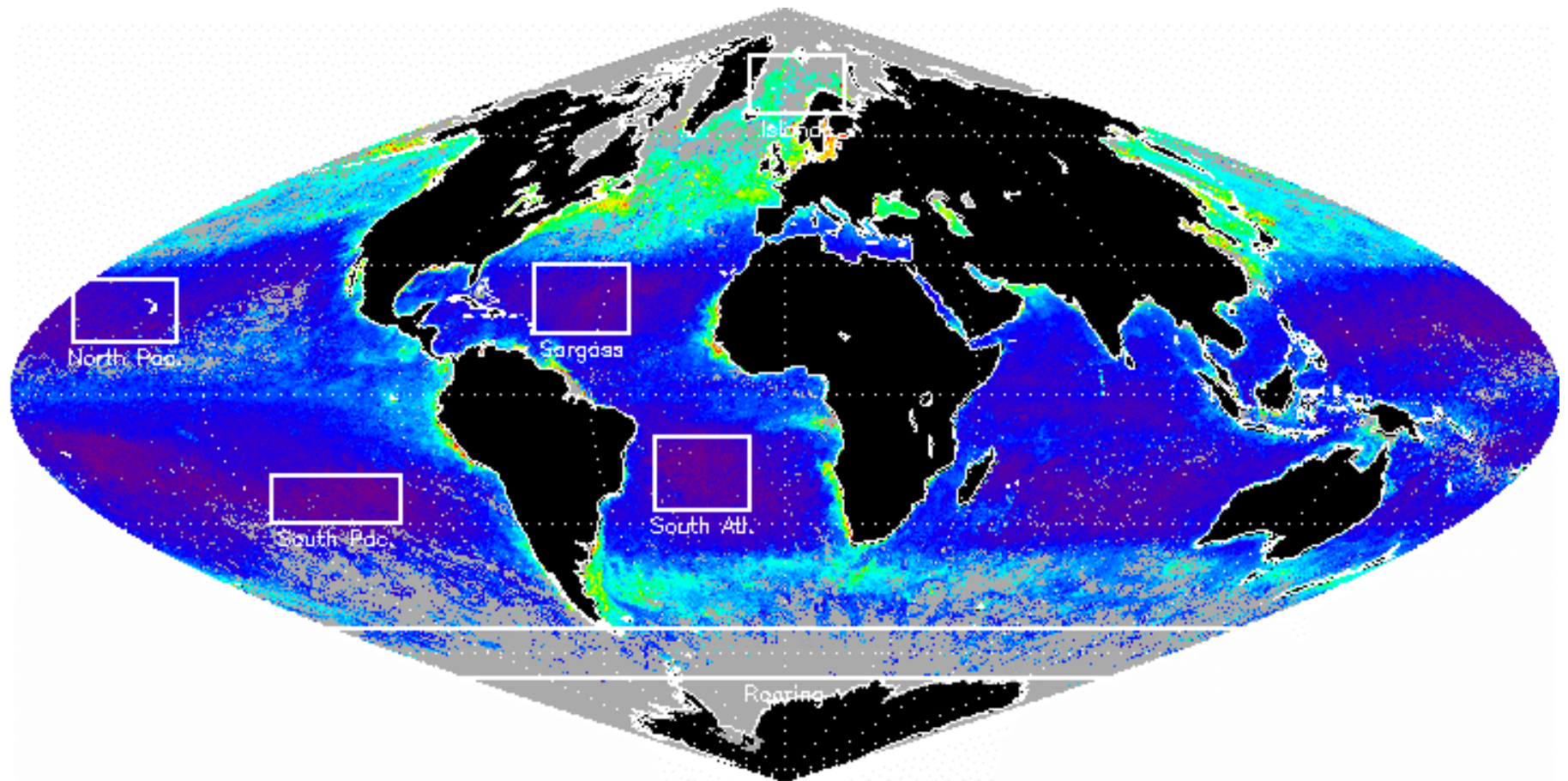
POLDER data courtesy of Jean-Marc Nicolas, Univ. des Sciences et Tech. de Lille, France

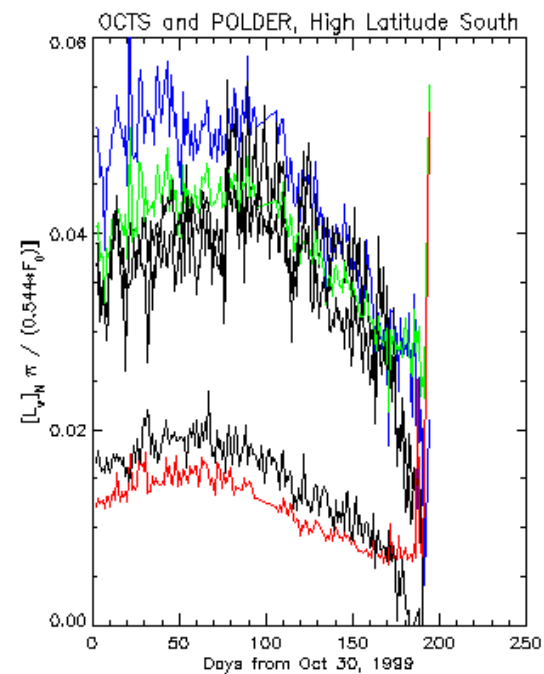
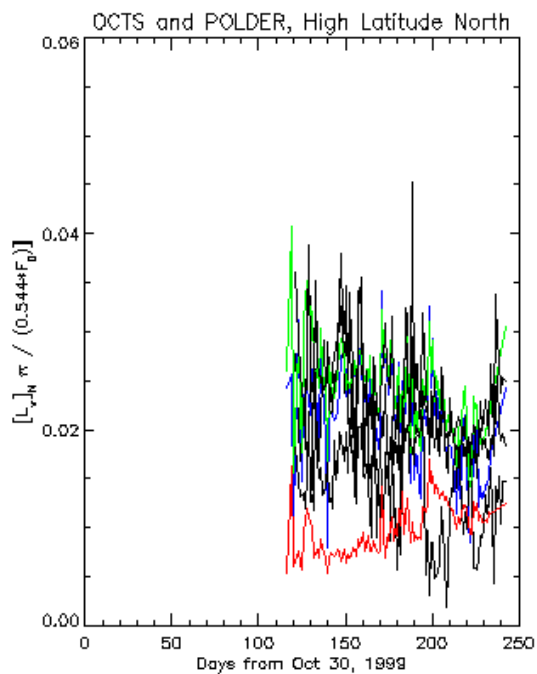
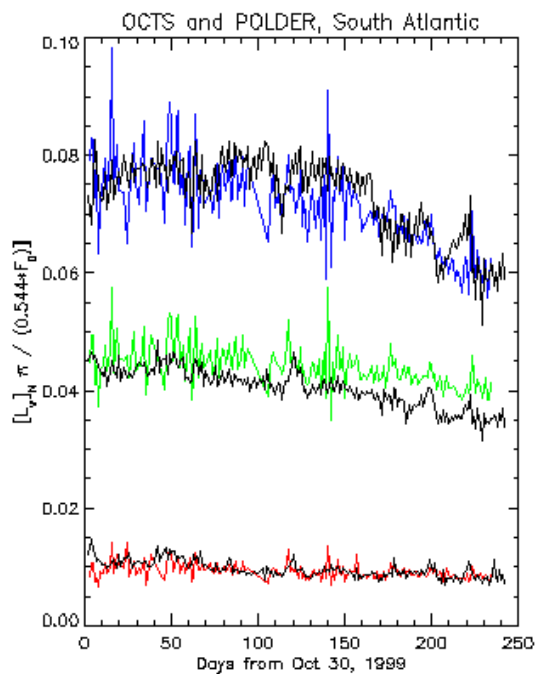
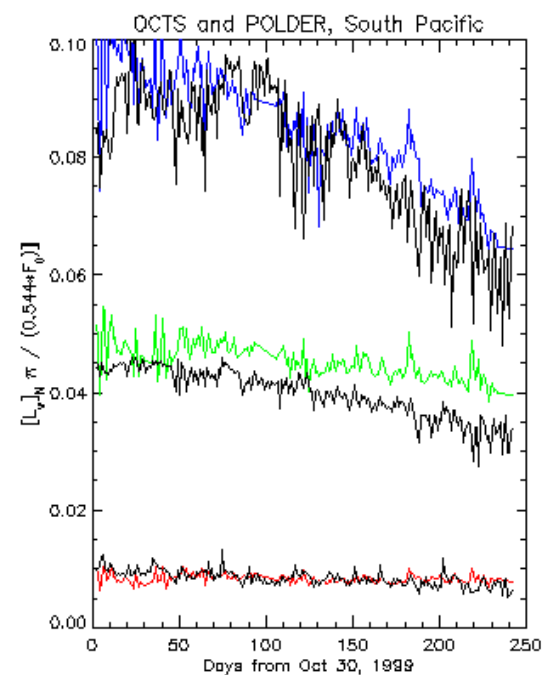
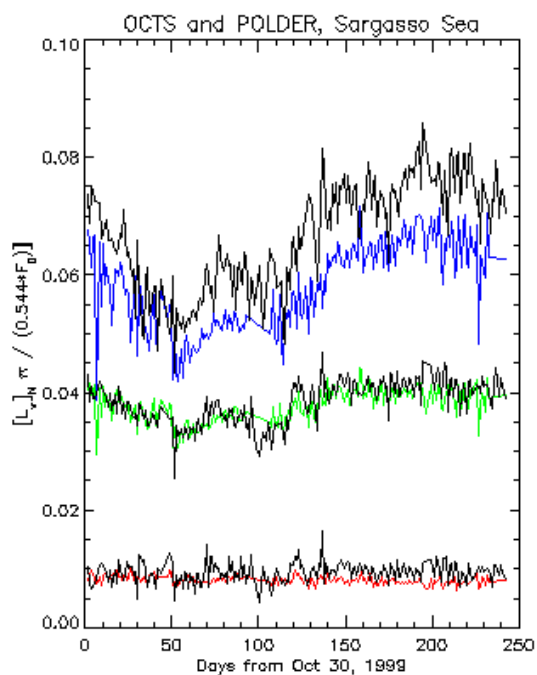
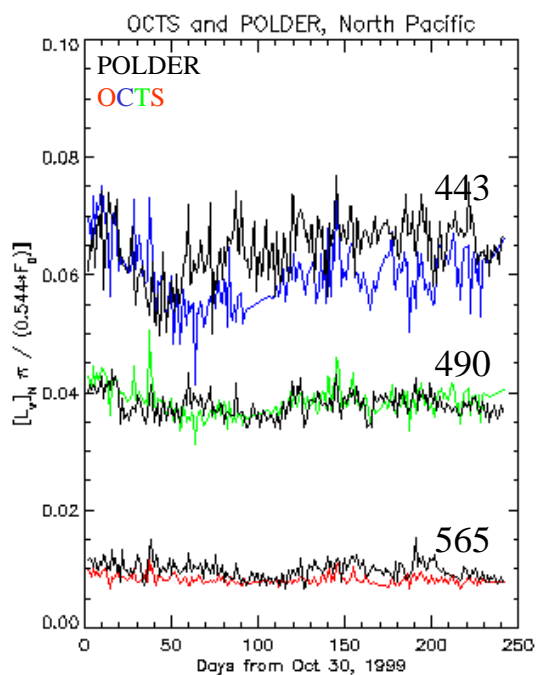


POLDER data courtesy of Jean-Marc Nicolas, Univ. des Sciences et Tech. de Lille, France

Temporal Variability: OCTS vs POLDER

POLDER data courtesy of Jean-Marc Nicolas, Univ. de Lille

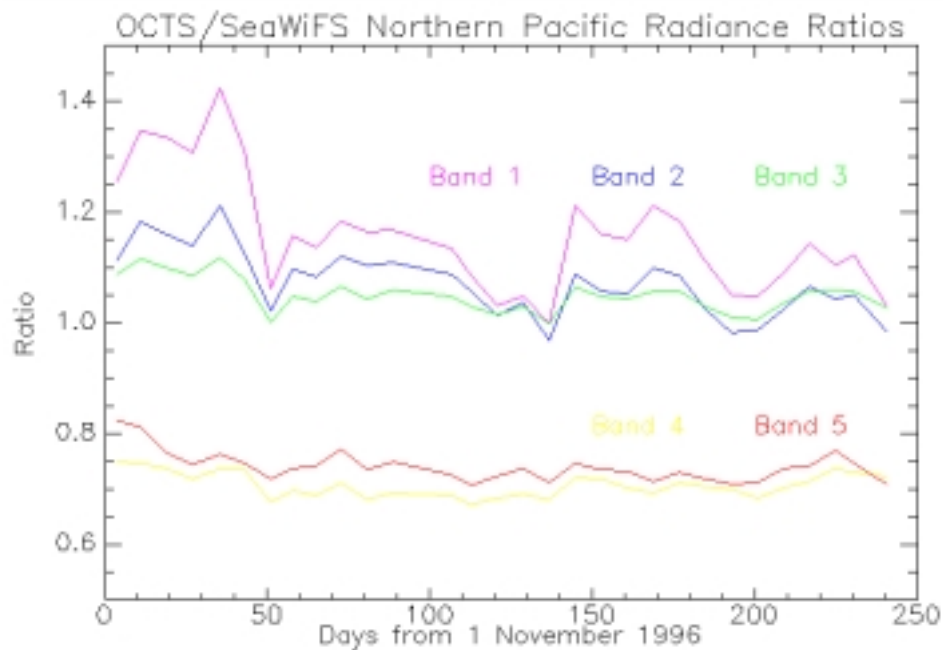
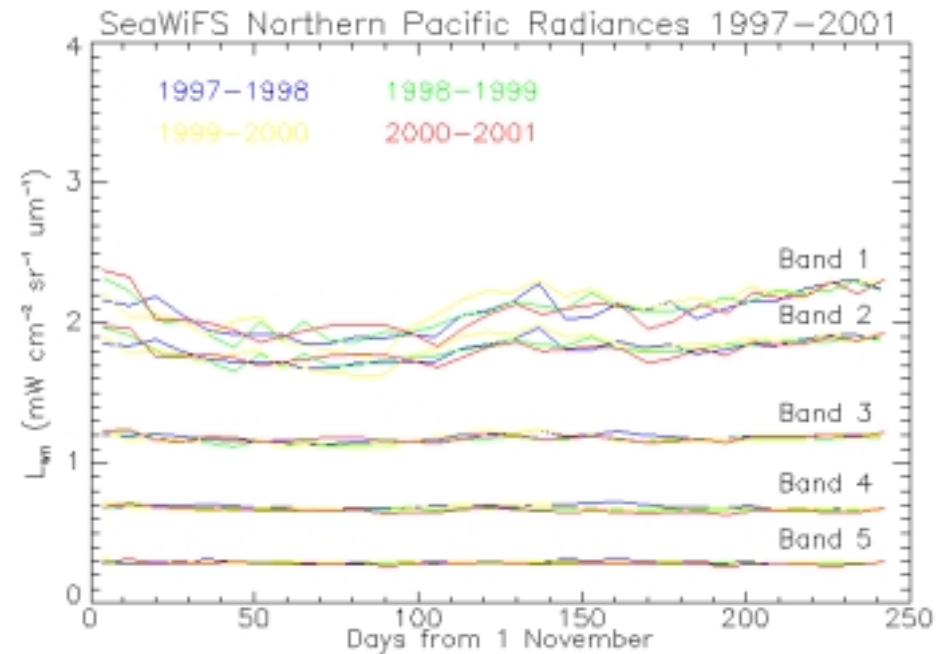
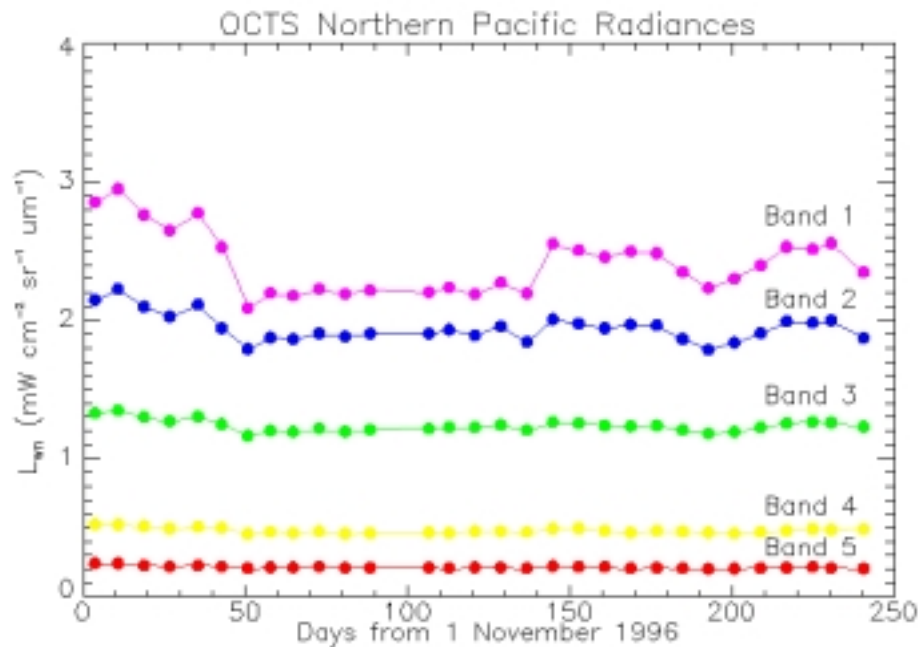




OCTS and SeaWiFS

Sensor and Mission Characteristics

	OCTS	SeaWiFS
Start of Imaging Ops.	Oct. 31, 1996	Sep. 18, 1997
End of Imaging Ops.	Jun. 30, 1997	Operational
Equator Crossing	10:30 a.m. Descending	12:00 p.m. Descending
Nadir Resolution (km)	0.7 LAC 4.2 GAC	1.1 LAC 4.5 GAC
Swath Width (km)	1400	2800 LAC 1500 GAC
Tilt Capability (deg)	+/- 20	+/- 20
Spectral Range (nm)	412 - 12,700	412 - 865
Spectral Channels	8 VIS/NIR 4 IR	8 VIS/NIR



SeaWiFS shows region to be very stable from year to year, with no observable impact of El Niño/La Niña in 1997-1998.

OCTS shows similar seasonal trends, but relative to SeaWiFS bands 1-3 are high and bands 4-5 are low.

OCTS to SeaWiFS ratio appears to be decreasing with time.